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Division of Mycology and Disease Survey

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THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XXII Number 18

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BACTERIAL DISEASES IN 1938

H. W. Anderson and H. H. Thornberry

The unusual prevalence and the severity of a number of bacterial diseases during the summer, in contrast to a rather normal season for fungous diseases, has given rise to some speculation as to the reasons for this phenomenon. It is probable that the explanation can be found in the character of the rains which have marked certain periods of rainfall in the Midwest, combined with the very favorable season for plant growth throughout the summer. In May, June, and July the rains were often so heavy that fields were temporarily inundated and it was thus possible for the inoculum to be widely distributed in a relatively short time. Heavy splashing of the water on the soil surface often resulted from the heavy downpours of rain during the period when the field crops were making their most succulent growth.

Some of the bacterial diseases which were observed in Illinois, northern Indiana, and Michigan and notes on their severity are listed below.

1. Barberry leaf spot (Phytomonas berberidis) was very severe on all Japanese barberry hedges examined.

2. Bean blight (P. phaseoli) caused extensive damage to commercial bean fields throughout Illinois, northern Indiana, and southern Michigan. Halo blight (P. medicaginis phaseolicola) was observed more generally later in the season but did not appear to be as destructive as the former blight.

3. Soybean leaf blight (P. glycinea (?)) was very abundant in all fields examined in central Illinois. The crop did not appear to suffer much from this attack.

4. Bacterial spot of tomatoes (P. vesicatoria) on both leaves and fruit appeared generally distributed throughout Illinois. It caused extensive losses on early ripening fruit but was less destructive later in the season.

5. Southern bacterial wilt of tomatoes (P. solanaceara) was the most common cause of tomato wilt in Illinois this season. It was much more abundant than Fusarium wilt, which for some reason was below normal in incidence this season.

6. Bacterial canker of tomatoes (P. michiganensis), while severe in a few fields this season, was strikingly less prevalent than in previous seasons. Very few cases were found in plants from the South.

7. Angular leaf spot of cucurbits (P. lachrymans). A severe outbreak of this disease was observed at Ovid, Michigan on seed cucumbers. Pumpkin, cantaloupe, squash, and watermelon showed a bacterial spot resembling closely that of the angular leaf spot. Cultural comparisons of the isolated bacteria are being made.

8. Bacterial leaf spot of peppers (P. vesicatoria) was very severe on sweet peppers in Cook County, Illinois, near Des Plaines.

9. Bacterial spot of peach (P. pruni). Probably the worst outbreak ever experienced occurred in Illinois.

10. Gladiolus bacterial blight (P. gummisudans) was very severe on some varieties of gladiolus at Ovid, Michigan.

11. Viburnum leaf spot (P. viburni), which had previously been reported only from Urbana, Illinois (Phytopath. 21: 907-912, 1931), was found this year near Des Plaines, Illinois, on Viburnum opulus. It is interesting to note that this leaf spot appears each year on one clump of shrubs in its original location at Urbana and has never been observed elsewhere until this season.

12. Horse-radish throughout Illinois was severely injured this year by Phytomonas campestris var. armoraciae. In the extensive East St. Louis horse-radish area, the disease was so severe as to cause general withering of the leaves.

(University of Illinois).

AN ISOLATED INSTANCE OF BEAN ANTHRACNOSE IN CALIFORNIA, UNDER OVERHEAD IRRIGATION

William C. Snyder

For the first time in the writer's knowledge, bean anthracnose was found well developed on beans growing in California. The planting was a small garden patch of Refugee Green on the immediate coast at Pacific Grove. Pods, picked in August, showed numerous dark sunken lesions with acervuli bearing masses of flesh-colored spores, typical of the disease. Lesions were also present on the leaves and stems. Colletotrichum lindemuthianum (S. & M.) Bri. & Cav., was isolated from the pods.

The seed used by the grower had been obtained in packet form from the Middle West, and presumably was infected. Anthracnose has never been detected in California seed bean fields.

Under normal conditions of bean culture in California (total lack of rainfall during the growing season) seed infected with the anthracnose fungus would present no hazard since the disease does not find the conditions neceexxary for its development. However, in the instance at Pacific Grove, the grower had watered the plants frequently by means of overhead sprinkling which, coupled with the humid climate in that location, provided the necessary conditions for the development and local spread of the fungus.

(University of California).

DISEASES FOUND ON DIRECT-SEEDED TOMATO FIELDS

H. Rex Thomas and L. C. Shenberger

The practice of sowing tomato seed directly in the field (direct seeding) as contrasted with the use of transplants has increased in the last few years. The question is frequently asked as to the amount of disease on such fields as compared with those set with transplants. Based on limited observations in Indiana and in the Hicksville section of Ohio, the following diseases have been found in direct-seeded fields in sufficient quantity to be of economic importance: anthracnose (Colletotrichum phomoides), Septoria leaf-spot (Septoria lycopersici), and early blight (Macrosporium solani [Alternaria solani]). A considerable quantity of leaf mold (Cladosporium fulvum) was found in one field at Hicksville. According to the grower no transplants had been used and the land had not been in tomatoes for five years. At time of sowing the seed had been treated with copper oxide (dry). All the fields in the immediate vicinity were direct-seeded and an accurate comparison could not be made as to the relative severity of these diseases on fields planted by the two methods. The date of planting seems to bear a close relationship to the amount of defoliation. Late-planted fields have less defoliation, but this appears to be related to the amount of fruit set and its degree of maturity. In Indiana where comparisons have been possible between portions of fields which have been direct-seeded and portions set with plants, no obvious difference in amount of defoliation was evident.

(Division of Fruit and Vegetable Crops and Diseases and Purdue Agricultural Experiment Station).

OBSERVATIONS ON CEREAL DISEASES

H. B. Humphrey

Wooster, Ohio, July 25. Stem rust (Puccinia graminis tritici) of winter wheat was relatively light, although general. It came too late to cause appreciable damage. Leaf rust [P. rubigo-vera tritici] was severe and general and caused early killing of the foliage of winter wheat. The incidence of stem rust was not a serious factor even in spring wheat, being fully 50 percent lighter than last year. Stem rust of oats was very light at Wooster. In the rust nursery, most varieties showed none at all and the greatest severity for any variety (Victoria) did not exceed 2 percent. Crown rust [P. coronata] was present on all varieties, except Bond, ranging from trace to 75 percent in severity. Commercial fields all showed some damage from crown rust. Very little smut was observed. In wheat there was a trace of scab [Gibberella saubinetii]; a trace of Septoria glume blotch [S. nodorum]; trace+to 5 percent of mildew [Erysiphe graminis]; no black or brown stem of rust-resistant wheats; a trace of black chaff [Bacterium translucens undulosum].

East Lansing, Michigan, July 26. Stem-rust infection of winter wheat was general but so light as to have caused little damage. The uniform rust nursery of spring wheat showed little or no rust (Hope, H-44) to nearly 100 percent on highly susceptible varieties (Haynes Bluestem, Carina, Loros). All durums, excepting Pentad, were copiously infected. I noted on Ceres x Hope-Florence C.I.11712 a black, poorly defined blotching of the necks of a very few heads, apparently not bacterial black chaff. If such discoloration is caused by or is a reaction to rust infection, why is it limited to so few plants? Why did it not appear on this and other varieties in the Ann Arbor nursery?

Wheat leaf rust was unusually severe and caused early leaf mortality in highly susceptible varieties. Alternaria disease was present but not serious. Drought prevailed throughout June and the first half of July and caused early ripening of both oats and spring wheat.

In the uniform oat-rust nursery certain selections (rows 16 to 30) showed only a trace to no stem rust and a trace to 50 percent of crown rust. This I attribute to their abnormally early ripening. Varieties ripening later caught both rusts (10 to 80 percent stem rust and 30 to 65 percent crown rust).

Ann Arbor, Michigan, July 26. Stem rust of wheat was general throughout the Ann Arbor territory. The damage to winter wheat was appreciable, but difficult to differentiate from the general damage caused by leaf rust. In the uniform rust nursery all durum varieties were severely rusted

excepting Pentad. Some of the hard red spring wheats were so badly affected as to be worthless. Leaf rust was unusually severe on spring wheats. It should be noted here that in Hope, H-44, Ceres x Hope N. No. 1098, Ceres x Hope-Florence Ns. 2592, and in all other rust-resistant varieties there was no false black chaff or other discoloration, save a trace of bacterial black chaff. Septoria glume blotch was absent or very light.

Brookings and vicinity, South Dakota, July 28. On oats crown rust was widely and generally prevalent. The severity in some instances amounted to as much as from 60 to 75 percent. Incidence was comparatively early; hence, damage to the crop was appreciable, reducing the yield from 20 to 40 percent. Stem rust was generally prevalent but causing relatively little damage. Its severity at Brookings ran from a trace to 30 percent. Other diseases of oats were of little importance so far as I was able to observe.

On wheat leaf rust infection was unusually early and severe and affected the yield of susceptible varieties, reducing it by from 10 to 40 percent. Stem rust was also severe on susceptible varieties, but its development and spread were inhibited by drought. Such completely susceptible varieties as Hard Federation and Marquis were rendered worthless, but it would be incorrect to attribute their failure wholly to stem rust. Foot and root rots were observed in a few fields of wheat yet to be harvested. The cause is as yet unknown. It is possibly a mineral-deficiency disease aggravated by Helminthosporium sativum and Fusarium spp.

Fargo, North Dakota, August 1 to 4. Stem rust was prevalent on wheat throughout the State, especially on such susceptible varieties as Marquis, Ceres, and Reward. In the Red River Valley there was a large acreage of Thatcher, highly resistant to stem rust, but susceptible to leaf rust. Stem-rust severity on highly susceptible wheats ran from 50 to 90 percent; hence, was ruinous to the crop. Thatcher, on the other hand, rarely showed a severity of as much as 10 percent. The yields were fair to good, with a weight of from 57 to 60 pounds per bushel; and the quality good to excellent. Stem rust was light to severe on durum wheat, especially Mindum and Kubanka, but of too late incidence to cause much damage.

Wheat leaf rust was widely prevalent and destructive. Susceptible varieties carried from 60 to 90 percent and were undoubtedly damaged. We have no field or other data to show how much the yield of Thatcher was reduced by leaf rust, but, judging from experimental results available for other wheats, it seems probable that this variety sustained appreciable damage, expressed in terms of yield by as much as 20 to 40 percent. Leaf rust was this year a limiting factor of more than usual importance throughout the spring-wheat States.

As in the past, what, for want of conclusive experimental evidence, has been considered as a Fusarium root rot, was found in the wheat nursery rows, where it had killed from 1 to 11 percent of the plants. Durum varieties seem especially subject to this kind of root rot. No field observations were made.

In the lower Red River Valley a number of wheat fields were observed in which the alkali-spot trouble was prevalent. Examination of the plants in these spots, almost without exception, showed the subcrown internode dead or diseased and the roots in like condition. Without other evidence little more than a guess can be made as to the cause or causes of death of such plants.

Crown rust was everywhere prevalent on oats, with severity ranging from 20 to 65 percent on susceptible varieties. Early incidence of crown rust undoubtedly was a contributing factor to weak straw and consequent lodging. Impaired photosynthesis resulting from rust had its effect on yield and quality of grain. Stem rust was prevalent but caused little damage to oats. Its severity ranged from a trace to 25 percent.

Langdon, North Dakota, August 4 to 6. On wheat stem rust was everywhere prevalent, with severity ranging from 60 to 90 percent on the most susceptible varieties. On Mindum and Kubanka, among the durums, infection was as much as 40 to 70 percent and, because of the immaturity of the plants, promised to cause some damage. Commercial durum fields were more advanced and although they were in some instances rather severely rusted, came through with but little damage. Of the common wheats, Thatcher was maintaining its record for stem-rust resistance, showing a severity in no instance greater than 5 to 8 percent and usually much less.

Here, also, leaf rust was general and severe, ranging from negligible on durom varieties to 80 to 90 percent in such susceptible common wheats as Ceres, Kota, and Thatcher.

On oats crown rust was widely prevalent, ranging in severity from 10 to 50 percent. Stem rust was scatteringly prevalent but of relatively mild severity, ranging from a trace to 25 percent.

(Division of Cereal Crops and Diseases).

THE CEREAL DISEASE SITUATION IN THE PALOUSE REGION OF IDAHO AND ADJACENT AREAS IN 1938

Wayne M. Bever

Rusts (Puccinia sp.). Meteorological conditions during the fall and winter of 1937-38 in the Palouse and bordering areas were optimum for the development and accumulation of inoculum of the cereal rusts. The weather records show that no really low temperatures were experienced during the winter and early spring months. Temperatures were such that most rust hosts were probably in a physiologically active state throughout the winter.

Stripe rust reached its maximum development about the middle of June which is approximately 3 weeks earlier than normal. The epidemic was the most severe ever observed by the writer. All susceptible grass hosts observed were literally covered with rust and in many instances were so badly damaged that they failed to head. In experimental plots susceptible wheat varieties such as Jones Fife, Fortyfold, and Federation had the leaves completely destroyed. The extent of the stripe rust epidemic in commercial wheat fields is not definitely known. The infection was severe in certain local areas while in others no infection was observed. Many commercial varieties are resistant to the race of stripe rust commonly found in this area.

Leaf rust (P. rubigo-vera tritici) was more prevalent than for the past several years. This rust appeared rather early in the season and spread quite rapidly for a time, but was slowed up by dry weather late in the season. At the Sandpoint substation infection was especially heavy on susceptible varieties such as Jenkin, Triplet, and Albit.

Stem rust (P. graminis tritici) was especially severe on susceptible varieties in the uniform spring wheat rust nursery and some damage occurred in commercial fields near barberry bushes. Heavy stands in the low lying sections of some fields near bushes were almost a complete loss. In general, in these same or neighboring fields where the altitude was somewhat higher and the air drainage better, little or no damage occurred. Several barberry hedges near Colfax, Washington, were literally covered with aecia and the low portions of wheat fields adjacent to them were heavily infected. Prior to June 12 uredial infection was extremely heavy, which was exceptionally early for stem rust infection. By the first week in July telia were so prevalent that the above mentioned fields appeared to be black.

Stem rust on spring barley was more prevalent than usual. Because of its late development it failed to reach epidemic proportions, only a trace having been recorded for the entire area.

Cercosporella Footrot of Wheat. Footrot was found in scattered sections through Nezperce and Camas prairie areas in Nezperce, Lewis, and Idaho

Counties on June 28. It was found in previously unreported areas but was most severe in the eastern portion of Lewis County near Nezperce, Idaho. It was estimated that one 800-acre field of Oro wheat would show a 30 to 40 percent loss. This field was visited again on July 22 by the writer, at which time the loss was estimated to be between 50 to 60 percent. Other fields in this particular section suffered considerable loss. No footrot was found in the Palouse area.

Bunt of Wheat (Tilletia sp.). In the above mentioned areas from a trace to about 2 percent smut infection was observed in all the fields visited. In Latah County some fields were estimated to have 5 to 10 percent infection.

A trace of the "short smut" (T. tritici) was found near Winchester, Idaho. Near Mohler, Idaho, as much as 1 or 2 percent was found in some of the fields examined. This is much more than ever observed in this particular section and indicates that this smut is becoming more prevalent. "Short smut" was found in Latah County for the first time this year, one field of Mosida wheat showing a trace. No other infected fields were found, although a careful survey was made throughout the entire county. "Short smut" failed to appear near Plummer, Idaho, where it was found in abundance in 1936.

Frost and Heat Damage. In certain areas frost damage was very evident in the fall-sown wheats. On May 2, 3, 5, and 6, when much of the wheat was in the flowering stage, a minimum temperature of 32° was recorded. As a result, many white and sterile heads were found over the entire wheat-growing areas of Latah, Lewis, Nezperce, and Idaho Counties. The damage was most severe in the swales and valleys; however, farmers brought in samples collected from higher areas showing frost damage. The extent of the damage could not be accurately estimated, but there was at least a trace.

Spring wheat in the vicinity of Moscow suffered considerably from lack of moisture in combination with high temperatures. The head size was reduced and considerable shriveling of the grain was noted in several fields. It was estimated that the yields were reduced approximately 15 to 20 percent.

More spring grain was seeded in Latah County this year than for the past several years.

Barley Covered Smut (Ustilago hordei). A larger acreage of Hannchen barley was grown in the Palouse and prairie regions than in all previous years in which the writer has had opportunity to make observations. No smut was found in the fields of Hannchen examined. A trace to about 15 percent was observed in some fields of Union Beardless. A trace was noted also in some fields of the White Winter variety. (Cereal Courier 30: 142-143. Sept. 10).

WHEAT FOOT-ROTS IN KANSAS IN 1938

Hurley Fellows

The take-all foot-rot was quite abundant, particularly on the heavier soils in certain sections of central Kansas in 1938. Very little was found on the lighter more sandy soils even though take-all had been found there in previous years. The crinkle-joint symptom in the upper joint was more prevalent this year than ever before. This was probably because of the excess moisture throughout central Kansas and the late appearance of the disease.

In eastern and central Kansas wheat ripened prematurely and did not fill as well as expected. This has been attributed variously to late frost, rust, excess moisture, and foot-rot, with a varying amount of emphasis placed on each. The writer is not inclined to believe that frost caused much damage, since the plants were able to grow vigorously and to good height after the frost. It is true that there were some frost-blighted heads in early varieties. Excess moisture was probably the factor responsible for most of the trouble. The soil was saturated to the point of run-off over a long period and it was during this time that large areas in the field showed white heads. Later many of the plants crinkled at the joints. Septoria in many cases was associated with the broken joints. Crinkle-joint in the upper node is often associated with drowning injury. It seems unlikely that foot-rot was entirely responsible for the premature ripening and poor filling. However, the crowns of affected plants were water-soaked and spongy, which symptoms are typical of drowning injury. Rusts, both stem and leaf, caused considerable damage.

The dryland foot-rot of the semiarid regions was not particularly severe except in isolated sections. This was perhaps due to the dryness of the soil in the fall, which prevented prompt germination in early-sown wheat. This disease was quite prevalent in early-sown summer-fallowed land which had enough moisture to permit prompt germination. In some of the sandy regions of northeastern Colorado, wheat was injured so badly by foot-rot that it was not harvested. (Cereal Courier 30: 122. Aug. 25).

SEVERAL CORN DISEASES UNUSUALLY PREVALENT IN ILLINOIS

Benjamin Koehler

Aplanobacter stewarti. After the report made earlier this season on the occurrence of bacterial wilt, this disease spread like wildfire onto the leaves of field corn in most of central and southern Illinois. In many fields the green leaf area was reduced by 25 percent by this infection. Infection came after tasseling had been completed and the leaves only became

infected, not the stalks. Miss Charlotte Elliott made bacterial cultures from a number of leaf specimens sent to her and she reported finding all isolations typical in appearance for A. stewarti. Later many of the blighted leaf areas became covered with Alternaria.

Helminthosporium turcicum. An unusual prevalence of Helminthosporium leaf blight was observed in a number of places in the State, sometimes in the same fields where bacterial wilt also occurred, but also at Elizabethtown in the extreme southern part of the State and at Kankakee in the northern part.

Diplodia zeae stalk rot. The two diseases just mentioned probably would not have caused farmers much alarm. In the middle of August entire plants were observed to die prematurely in early-planted fields and in early varieties. Before the end of the month many reports indicating this trouble were received. By the middle of September, 90 percent of the stalks were dead in a number of the worst-affected fields, and significant damage had occurred in nearly all fields except the late-planted ones in most parts of the State.

It had been observed in the springtime that there was an abundance of over-wintering pycnidia. The leaf infections, destroying green leaf area, no doubt made the stalks more susceptible to attack by Diplodia. It was also observed that the two-ear stalks were killed more often than those not bearing so heavily. Some of the popular hybrids were damaged as badly as or even worse than open-pollinated varieties. The damage is the worst in the writer's eighteen years experience with corn diseases.

(University of Illinois).

INCIDENCE OF EAR ROTS IN THE 1937 CORN CROP

Neil E. Stevens

The information on the incidence of corn ear rots here summarized was made available as in previous years through the courtesy of the Grain Division, Bureau of Agricultural Economics, U. S. Department of Agriculture, and is based on results of licensed inspections of shelled corn receipts at various terminals during June, 1938. The method of assembling information was that used and explained in earlier reports (P.D.R. 19: 71-93 and 20: 63-71, 316-320). These papers also give the reasons for considering total damage in June receipts as a fairly reliable index of losses due to disease in the corn as it reaches terminal markets.

As in previous years, such markets as Chicago, Buffalo, and Milwaukee, which regularly receive shipments from a wide area, are left out of

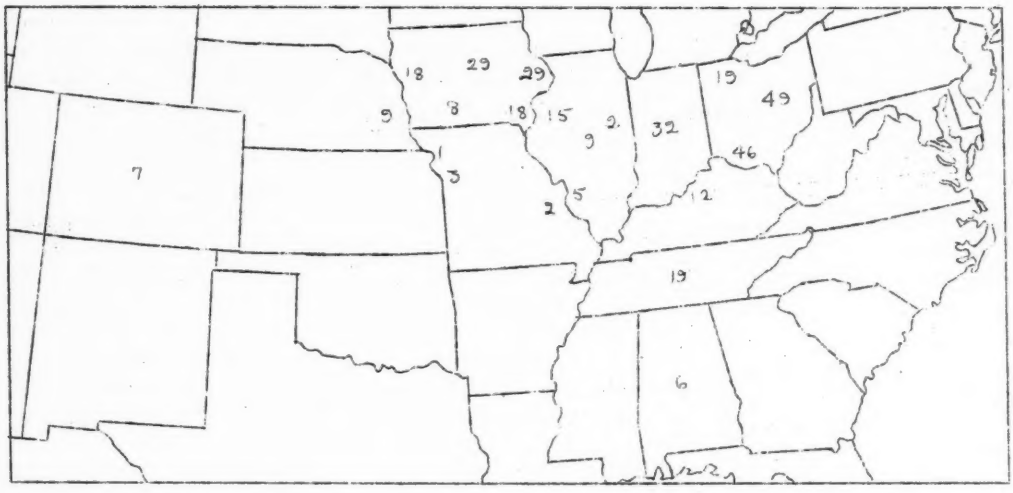

Fig. 1. June 1938 receipts - 1937 crop. Percentage of cars of shelled corn showing 5 percent or over total damage.

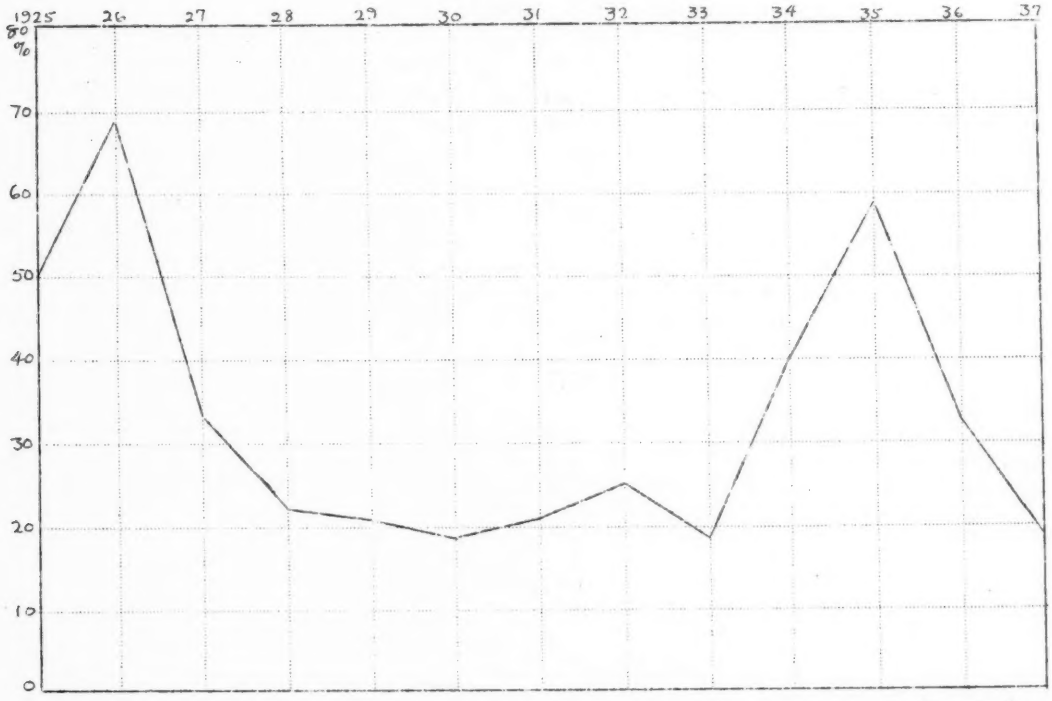

Fig. 2. Incidence of corn ear rots in the various crops as indicated by the percentage of cars of shelled corn received at terminals listed in the text, showing 5 percent or over total damage in June of the following year.

consideration, as are also those which received less than 50 cars during June, 1938. The map, Fig. 1, gives the percentage of cars of shelled corn showing 5 percent or over total damage received during June 1938 at Toledo, Mansfield, Cincinnati, Ohio; Louisville, Kentucky; Indianapolis, Indiana; Peoria, Decatur, Champaign, East St. Louis, Illinois; Cedar Rapids, Clinton, Des Moines, Keokuk, Sioux City, Iowa; St. Louis, St. Joseph, Kansas City, Missouri; Omaha, Nebraska; Denver, Colorado; Nashville, Tennessee; and Birmingham, Alabama. Comparison of the map for 1937 with that for 1936 shows that of the 15 terminal markets included in both, 12 show a decrease in the percentage of cars having 5 percent or more total damage, and only 3 show increases. The average for all the terminals listed in the text was only 18 percent (Fig. 2) which is comparable to such years as 1930 and 1933. If the large markets reporting, but not indicated on the map, are included, the average percentage of cars having 5 percent or more total damage is still only 22.

(University of Illinois).

BRIEF NOTES ON PLANT DISEASES

BLISTER SPOT ON APPLES IN PENNSYLVANIA: Blister spot of apples caused by Pseudomonas papulans Rose was found on Stayman apples in the D. M. Wertz orchard at Quincy, Franklin County, Pennsylvania. A check in the orchard on September 14 showed that an average of 20 percent of the apples had one or more spots. This spot has been noted in previous years but was confused with suppressed scab. An occasional apple with blister spot was also found in the H. W. Skinner orchard. Through the courtesy of Dr. John W. Roberts, specimens of diseased apples from the Wertz orchard have been compared with diseased apples from the orchard in Arkansas where the disease was first found. (George L. Zundel, Pennsylvania State College).

BACTERIAL PUSTULE ON SOYBEANS IN GEORGIA: S. B. Fenne, Extension Pathologist in Georgia, sent specimens from Tifton, September 7, with the remark that the disease was generally distributed in the Coastal Plain section of the State. The organism was determined by Miss Florence Hedges of the Division of Fruit and Vegetable Crops and Diseases as Bacterium phaseoli sojense.